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Food & Nutrition **Research Briefs**

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HNIS Is Back

The programs of USDA's former Human Nutrition Information Service are once again part of the Agricultural Research Service after 13 years as a separate agency. And we're happy to have them back.

ARS's Beltsville Human Nutrition Research Center in Maryland has integrated the former HNIS staff that maintains Handbook 8 and its corresponding electronic databases, containing the nutrient profile of more than 6,000 foods, and another staff that conducts nationwide food consumption surveys and research. ARS's Family Economics Research Group in Hyattsville absorbed former HNIS staffers involved in nutrition education, such as the Food Guide Pyramid. Many of the outreach programs have been absorbed by the ARS Information Staff.

The action unites basic scientists who make new discoveries on the amounts and kinds of nutrients that allow us to function optimally with researchers who keep a watchful eye on the dietary habits of the U.S. population and with educators who take established nutrition findings and translate them into practical advice, such as the Dietary Guidelines for Americans.

Antioxidants and a Jekyll-Hyde Virus

Deficiencies in selenium or vitamin E—both antioxidant nutrients—turned a normally mild mannered virus into a disease-causing strain in mice. This demonstrates the important role of nutrition in the severity of viral infection, according to researchers with ARS and the University of North Carolina who made the discovery. UNC virologists inoculated selenium-deficient mice with the benign B3 strain of Coxsackie virus. A close relative, the B4 strain, was isolated from Chinese people with Keshan disease—heart muscle damage that was once common in the Keshan region of China where the soils lack selenium. To the researchers surprise, the selenium-deficient mice developed similar heart muscle damage from the benign B3 strain.

What's more, when they inoculated virus taken from the selenium-deficient mice into animals that got ample selenium, it again caused heart muscle damage. The benign strain had apparently mutated into a virulent strain while residing in the selenium-deficient animals.

Similar results occurred with vitamin E-deficient mice. It's likely that this Jekyll to Hyde transformation occurs in other viruses as well. Others have suggested that poor antioxidant status may influence influenza, hepatitis or HIV infections. For more information, contact Orville A. Levander, (301) 504-8504, Beltsville Human Nutrition Research Center, Beltsville, MD; or Melinda A. Beck, (919) 966-6809, University of North Carolina, Chapel Hill.

Bone Health at Any Age

A lifelong habit of walking about a mile a day can reduce the risk of osteoporosis in women—whether or not they engage in sports or other physical activities. A year-long study of 238 healthy women past menopause found that those who habitually walked more than 7.5 miles a week had denser bones, particularly in the legs and trunk, than those walking shorter distances. Also, the mile-a-day walkers had slower rates of bone loss in their legs during the study.

Researchers measured bone densities in the women and took detailed histories of their physical activities from age 14. The study was the first to correlate women's bone density with their walking history alone. An earlier study by others found a comparable correlation for all activities on foot to age 50. Osteoporosis results from a long-term loss of bone minerals, which accelerates around the time of menopause, leaving the bones porous and prone to fracture. It also affects men and will increase as a health problem among men as they live longer. For more information, contact Elizabeth Krall, (617) 556-3074, Human Nutrition Research Center on Aging at Tufts, Boston, MA.

Little girls would benefit from increasing calcium intake several years before age 11. Building strong bones in youth is still the best prevention of osteoporosis. And in a study of 50 girls ages 5 through 16, most bone formation occurred in the years just before and just after the start of puberty. The first signs of puberty in U.S. girls can occur between age 8 and 11, the average age being 10. Menstruation begins two to three years later, with age 12.5 being average. Girls in the study had a rapid drop in bone formation within

two years after menstruation. By age 15, very little bone was added. This suggests the current recommendations for increasing calcium intake to 1,200 milligrams in 11- to 24-year-olds may need to be adjusted to begin at an earlier age. Four 8-ounce glasses of milk provide about 1,200 mg calcium.

According to the National Osteoporosis Foundation, half of American women over age 50 and three quarters over age 75 have significant bone loss. The concern is that these numbers may increase because milk consumption and thus calcium intake among young adolescent girls has dropped alarmingly over the last several decades—from about 1,400 mg daily in 1950 to 900 mg today.

However, in a study of teenage girls with anorexia nervosa, calcium supplements didn't reverse bone loss. Anorexia is a serious undereating disorder that affects some adolescent and young women. Six of the 13 teens in the study were anorexic and hospitalized. Using stable (nonradioactive) isotopes of calcium, researchers measured how much of the mineral the 13 girls absorbed from their diets, excreted through the urine and deposited in or lost from their bones.

The anorexic girls excreted four times more calcium daily than the control group—and most of the lost mineral came from bone. Also, they did not absorb any more calcium than the control group even though they were getting significantly more of the mineral through supplements. The anorexic girls had elevated levels of the hormone cortisol, which has been linked to a defect in the body's use of calcium. This indicates that treatment of the hormonal imbalance may be necessary to stem bone loss. For more information on these two studies, *contact Steven A. Abrams, (713) 798-7000, Children's Nutrition Research Center, Houston, TX.*

Riboflavin after 60

Senior citizens need the same amount of riboflavin—vitamin B—as young adults even though they consume fewer calories, according to the first such study of older people in their 60s and 70s. The Recommended Dietary Allowances for riboflavin have been set a little lower for people over age 50 based on the assumption that because they eat less than younger people, they should need less of the vitamin. This study questions that assumption and shows the need for solid data for all age groups. Also, the study found that people in general need about 11 percent less riboflavin if they eat a vegetarian-type diet that is high in carbohydrates and low in fat compared to a high-fat, Western type diet.

ARS collaborated with researchers in Guatemala, where more than half the rural elderly are riboflavin deficient. By increasing riboflavin intake in these deficient subjects in small increments over a period of several months, researchers found the threshold—the

amount that caused the subjects' excretion of the vitamin to jump significantly. This shows the body is getting enough and is simply dumping the excess. The RDA now calls for men under age 50 to get 1.7 milligrams of riboflavin daily vs 1.4 over age 50 and for younger women to get 1.3 mg vs 1.2 for older women. The richest sources are liver, American cheese, vitamin-fortified cereals, almonds and buttermilk. For more information, *contact Robert M. Russell, (617) 556-3139, Human Nutrition Research Center on Aging at Tufts, Boston, MA.*

90 Something and Pumping Iron

In only 10 weeks, nursing home residents in their 80s and 90s walked faster, climbed stairs more easily and were more physically active after doubling their leg muscle strength through weight training. A study of 100 residents of a large, full-care center for the elderly in Boston's suburbs showed that the high-intensity weight training is a feasible and effective means to counter muscle weakness, physical frailty and falls in the oldest old. That's good news for the approximately two million elderly living in nursing homes because falls are the most common accidental injury among the elderly. The study also found that giving undernourished elderly high-calorie supplements to help reduce muscle loss won't increase their total calorie intake unless they exercise regularly.

Of the many factors that contribute to muscle loss, disuse and undernutrition have the potential to be prevented or reversed. Half the participants worked hip and thigh muscles important to mobility during 45-minute sessions three days a week. The other half participated in an activity or exercise of their choice. The weight-trainers increased the strength of thigh and hip muscles by 113 percent, improved their walking speed by 12 percent and their ability to climb stairs by nearly 30 percent, compared to little or no improvements in the control group.

In addition, half of each group got a 360-calorie, high-carbohydrate drink each day, while the other half got a four-calorie placebo. The extra calories didn't further improve physical function in the weight trainers. And the control group merely substituted the calories in the supplement for those from their normal food intake. ARS and the National Institute of Aging funded the study. For more information, *contact Maria Fiatarone, (617) 556-3075, Human Nutrition Research Center on Aging at Tufts, Boston, MA.*

A family history of diabetes may make it more important for women past menopause to avoid consuming too much refined sugar than it is for men. A study of male and female rats—bred to become obese and develop diabetes—found that the females produce more of certain steroid hormones than males. These hormones, called glucocorticosteroids, hamper insulin from doing its job. A high-sugar diet increased production of the steroids even more. Estrogen blocks the insulin-depressing effect of the glucocorticosteroids. So the female rats actually had lower blood sugar levels than the males because they were protected by their high estrogen levels. But in women with low estrogen levels, such as after menopause, higher levels of these hormones may contribute to the onset of diabetes in women at risk. The study was done at the Beltsville Human Nutrition Research Center in Maryland. For more information, *contact Paddy Wiesenfeld, (301) 594-5825, now with Food and Drug Administration, Rockville, MD.*

Undereating can depress people's infection-fighting capability when they are also under extreme overexertion—even young, physically fit bodies. That's what happened to men in the rigorous U.S. Army Ranger training program and to others competing for the Special Forces. One group of Ranger trainees consumed only 70 percent of the calories they burned daily and had a 50 to 60 percent drop in one test of immune response—T-cell function—during the eight-week course. A second group was given more calories—80 percent of what they burned daily—and that put less of a strain on T-cell function. It fell an average 30 percent. A third group of Special Forces aspirants replaced 94 percent of the calories they burned daily, and their T-cell function dropped about 20 percent. By contrast, a fourth group of women had a dramatic improvement in T-cell function after eight weeks of basic training. It increased 150 to 200 percent because they got more than enough calories to replace what they burned, and their exercise program was moderate. For more information, *contact Tim R. Kramer, (301) 504-8459, Beltsville Human Nutrition Research Center, Beltsville, MD.*

Pound for pound, infants burn more calories than children or adults. That's because a larger percentage of infants' body weight is devoted to organs—such as heart, liver, brain—which have a higher metabolic rate than muscle tissue. Adults, on the other hand, have a larger percentage of body weight devoted to muscle tissue. As a result, energy requirements from birth to adulthood don't increase at the same rate as body

weight. The findings come from an ongoing study of the energy infants, children and adults expend while sedentary. Researchers here and at other centers are collecting data on the amount of energy needed to maintain basal functions, metabolize meals and do minimal physical activity because it gives a more precise basis for estimating daily calorie requirements than basal metabolic rate. For more information, *contact Nancy F. Butte, (713) 798-7000, Children's Nutrition Research Center, Houston, TX*

Cutting the Fat

Leaner meat products could result from combining freeze-drying and supercritical fluid extraction (SFE) in meat processing. In tests, SFE was effective in reducing both fat and cholesterol from freeze-dried, precooked hamburger patties. SFE uses pressurized carbon dioxide to reduce the fat and cholesterol. For years, the food industry has used SFE, for example, to decaffeinate coffee and extract beer hops. Tests run by ARS scientists, in collaboration with University of Illinois meat scientists, showed that non-toxic carbon dioxide could produce a meat product lower in fat and cholesterol while retaining enough fat to meet taste requirements of health-conscious consumers. For more information, *contact Jerry W. King, (309) 681-6203, Food Quality and Safety Research, Peoria, IL.*

And leaner chicken and ham could result from feeding animals an amino acid. ARS and University of Maryland, Eastern Shore (UMES) scientists have applied for a patent on this use of N-methyl aspartic acid (NMA), a modified form of the amino acid aspartate. NMA tells the body to secrete more growth hormone. That hormone stimulates the production of protein and suppresses the production of fat. When UMES scientists fed the amino acid to chickens, the birds were found to have less fat than chickens given the same diet but without NMA. ARS scientists consulted with university researchers on the design of the experiment and analyzed the blood for growth hormone and insulin-like growth factor-I, a hormone responsible for muscle growth in mammals and poultry. For more information, *contact John P. McMurtry, (301) 504-8803, Non-Ruminant Animal Nutrition Laboratory in Beltsville, MD; Claude R. Barb, (706) 546-3226, Animal Physiology Research in Athens, GA; or Jeannine Harter-Dennis/Mark Estienne, (410) 651-6194, UMES Department of Agriculture.*

New Food Ingredients, Maybe

Corn bran may be a source of new compounds similar to those present in rice bran that appear to lower blood cholesterol and blood fat levels in humans. ARS researchers previously discovered members of a class of compounds called sterol esters in the outer layers of corn kernels known as the bran. When scientists began developing a way to separate these sterol esters from the corn bran, they uncovered 10 other types of sterol esters. Refined corn bran is used as a fiber source in some diet food plans and breakfast cereals. For more information, *contact Robert A. Norton, (309) 681-6251, Mycotoxin Research in Peoria, IL.*

Nutrition-rich dry beans might increasingly be used to produce flour in the food industry. ARS scientists have shortened the steps for making flour from raw beans—good sources of protein, fiber, folate, iron, phosphorus, potassium and magnesium. Bean flour made from this streamlined process could be a candidate ingredient for soups, gravies, breads, muffins, hot and cold cereals, pancakes, cookies and other foods. The researchers made the flour in a machine called a twin-screw extruder. It converts freshly ground, raw beans into a crisp, rope-like strand that is passed through a mill to yield light, fine-textured cooked flour. The process took about 10 minutes, whereas the traditional method takes much longer. And extrusion uses less energy and leaves no cooking wastewater to pose disposal problems. The researchers have tested extrusion with small white beans and expect it to work with other kinds. For more information, *contact Richard H. Edwards, (510) 559-5852, Cereal Product Utilization Research, Albany, CA.*

Safer Water

Giant six-foot-tall test tubes filled with soil evaluate chemical pollution threats to ground and surface water. Fertilizers, pesticides, naturally occurring trace elements and heavy metals can move through the soil along with water. But early measurements allow time to find ways to prevent pollution hazards. ARS scientists have found that the test tubes are more accurate and less costly than the old-style lysimeters, which are buried in soil and cost up to 10 times more. The researchers are using four of the new devices—called weighing lysimeters—to evaluate computer models for predicting chemical movement. They also use the lysimeters to compare and validate results obtained from lab and field studies. For

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more information, *contact Dennis L. Corwin, (909) 369-4819 at the U.S. Salinity Laboratory, Riverside, CA*

Pollution “hot spots” and environmentally sound farming practices stand out with a new computer model that tracks the movement of pesticides and fertilizers as water flows over thousands of acres in a watershed. The model simulates water and chemical movement on a daily basis, year-round. Each watershed is subdivided into grids so that areas with the highest chemical runoff can be pinpointed. Knowing the source enables state agencies to accurately recommend needed changes in farming practices. The model, called ANN-AGNPS for Annual-Agricultural Nonpoint Source pollution, also allows a comparison of farming practices to see which result in the least loss of chemicals to groundwater, rivers and lakes. Earlier versions of the still-developing model are in use by the U.S. Environmental Protection Agency. The software has been requested by people in every state, ranging from government agencies and environmental consultants to lakeshore property owner associations. For more information, *contact Robert A. Young, (612) 589-3411, North Central Soil Conservation Research Lab, Morris, MN.*

A new bait for the corn rootworm beetles uses 95 to 98 percent less insecticide than conventional sprays to suppress the pests. Corn rootworms are the target of almost half the insecticides used in row crops in the United States. Less than an ounce of carbaryl insecticide per acre is used in the bait, which is sprayed on corn leaves. The beetles eat the bait compulsively when dried and ground roots of wild buffalo gourds are added. But the root's bitter compounds are not attractive to ladybugs, bees and other beneficial insects. In three years of tests on private farmland, the concoction dramatically reduced beetle populations and thus the number of eggs laid. That means farmers would not need to apply insecticide to the soil before planting as they routinely do now to prevent the rootworms from emerging. ARS developed the bait in cooperation with private industry and state experiment stations in five Midwestern states. For more information, *contact Larry Chandler, (605) 693-5239, Northern Grain Insects Research Lab, Brookings, SD.*

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